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ORIGINAL ARTICLES

Lipoidal Content and Anti-inflammatory Activity of *Adenanthera pavonina* L. Leaves

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ABSTRACT

The dried powdered leaves of *Adenanthera pavonina* L. were successively extracted with solvents of increasing polarities (petroleum ether, chloroform, ethyl acetate and aqueous ethanol). The total ethanol extract of the powder was also prepared. The petroleum ether extract was fractionated into unsaponifiable matter (USM) and fatty acids (FA). The FA fraction was methylated to give FAME fraction. GC/MS analysis of the USM revealed the identification of fifty compounds represented 80.1 % of the total USM, with squalene (16.38%) as the major compound followed by n- hentriacontane (14.61%), phytol (10.29%) and 2,2-diethoxy ethanamine (8.34%). Oxygenated compounds represented 27.22 % of the total USM. GC/MS analysis of FAME fraction revealed the identification of twenty four compounds represented 88.49 % of the total fraction, with methyl hexadecanoate (19.25%) as the major compound followed by methyl 9,12,15- octadecatrienoate (12.69 %), methyl eicosanoate (10.14%), methyl-9- octadecenoate (10.06%) and methyl 9,12-octadecadienoate (9.23%). The unsaturated FA represented 32.52 % of the total fraction. Column chromatographic fractionation of the petroleum ether extract resulted in the isolation of the sterol fraction which was analyzed by GLC and isolation for the first time of three triterpenoid compounds, which were identified as 22-hydroxy hopan-3-one, 24-methylene cycloartanol and betulinic acid. The LD_{50} of the total ethanol extract was determined. The acute anti- inflammatory activity of the total ethanol and successive extracts was evaluated by the carrageenan induced rat hind paw oedema test, which revealed significant effects of all extracts. The most potent effect was exhibited by 100 mg / kg b.wt. of the total ethanol extract (91.27 % potency) in comparison with indomethacin (100 % potency).

Key words: *Adenanthera bavonina,* unsaponifiable matter, fatty acids, triterpenes, sterols, anti-inflammatory activity.

Introduction

Adenanthera pavonina or *Adenanthera gersenii* Scheff (fam. Fabaceae, sub-fam. Mimosoideae), also known as red sandalwood tree, is used for its timber. The tree is common within the tropics of the old world. This tree is useful for nitrogen fixation, and it is often cultivated for forage, as a medicinal plant, as an ornamental garden plant and urban tree. The raw seeds are toxic but can be eaten when cooked (Corner, 1997). The young leaves can be cooked and eaten. The wood of the plant has been used for decorative wood products and the fruits are consumed by local people (Benthall, 1946, Clark and Thaman, 1993). Various parts of this plant have also been used in traditional medicine for the treatment of asthma, boil, diarrhoea, gout, inflammations, rheumatism, tumor and ulcers, and as a tonic (Watt and Breyer-Brandwijk, 1962, Kirtikar and Basu, 1981, Burkil, 1994, Dr Duke's, 2009). The seeds have been found to be effective in treating cardiovascular diseases during pregnancy. Phytochemical studies on this plant revealed the presence of various secondary metabolites including mainly flavonoids, steroids, saponins and triterpenoids (Chandra *et al*., 1982, Yeoh *et al*., 1984, Enuo, *et al.* 2007). The stem bark was reported to have a significant antioxidant activity. Also the root and stem bark extracts showed cytotoxicity against brine shrimp *Artemia salina* (Rodrigo *et al*., 2007). The extracts of the plant were reported to have antibacterial activity (Jayasinghe *et al*., 2006) and antifungal activity (Izabela *et al.,* 2004). The extracts of the bark of *A. pavonina* were found to have a significant in vivo anti-inflammatory activity in the carrageenan-induced rat paw oedema model provide some scientific evidence to the traditional uses of this plant for treatment of various inflammatory conditions, e.g. gout, rheumatism and tumors (Arzumand *et al.,* 2010). Seeds of *Adenanthera pavonina* afforded a better protection against diabetes, hyperlipidemia and free radical scavenging capacity (Krishnaveni *et al*., 2011).

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Material and Methods

Plant material:

Fresh leaves of *Adenanthera pavonina* Linn. were obtained from the Zoo in May 2008. The plant was identified by Mrs. Terase Labib, Taxonomist of Orman Garden, Giza, Egypt and confirmed by the Botanist Specialist, Dr. M. El-Gebaly, NRC. A voucher specimen was kept in the Herbarium of Pharmacognosy Department, National Research Centre.

Chemicals:
1. Indomethacin (Indocid), Kahira Pharm. Ind. Co. A.R.E. as a standard anti-inflammatory agent.
2.Carrageenan, Sigma Co. for induction of acute inflammation in rats.

Animals:

Adult albino rats, of Sprauge Dawely Strain weighing 130-150 g and Albino mice weighing 25-30 g were used. Animals were obtained from the Animal House Colony of the National Research Centre, Dokki, Egypt. They were kept under the same hygienic conditions and well-balanced water and diet. Normal diet consisted of vitamin mixture 1%, mineral mixture 4%, corn oil 10%, sucrose 20%, cellulose 0.2%, and casein (95% pure) 10.5% and starch 54.3%.

Apparatus:

1. HP 6890 Series / HP 5973 (Agilent) for GC/MS analysis of unsaponifiable matter and fatty acid methyl esters.
2. Agilent technologies 6890 N (Network GC system) U.S.A. for GLC analysis of the sterol fraction.
3. Electrothermal 9100 for determination of mp of the isolated compounds.
4. Jasco FT/IR-6100, Japan for determination of IR spectra.
5. DI Analysis Shimadzu QP-2010-Plus for determination of EIMS of compound 1 and 2.
6. Jeol JMS-Ax500, mass spectrometer for determination of EIMS of compound 3.

Conditions of GC/MS analysis:

Capillary column of Thermo scientific.TR-5MS (5% Phenyl Polysil Phenylene Siloxane), 30 m length, 0.25 mm id, 0.25 µm thickness was used; carrier gas, Helium at 13 psi; injector temp.: 200 °C, detector temp.: 280 °C, temperature programming, 60 °C for 5 min., 60-280 °C at a rate of 5 °C /min., 280 °C for 10 min.; detector, mass spectrometer detector.

Conditions of GLC analysis:

Column: capillary column HP-5, (5% Phenyl Methyl Siloxane), 30 m length, 0.32 mm id and 0.25µm film thickness, initial temp.:80°C, initial time: 1.00 min. rate: 8°C/min, final temperature: 300°C, inlet temp.: 250°C, detector: 300 °C (FID), flow: 2 ml/min, carrier gas: N_2 30 ml/min, H_2 30 ml/min, Air 300 ml/min.

Extraction of the leaves:

Two hundred grams of the dried powdered leaves were exhaustively extracted with 95% ethanol in continuous extraction apparatus. The ethanol extract was evaporated under reduced pressure till dryness to give 48.92 g (Total ethanol extract). Eight hundred g of dried powdered leaves were successively extracted with petroleum ether, chloroform, ethyl acetate, and aqueous ethanol (70%). Each extract was evaporated under vacuum to dryness and the residues were weighed to obtain 48, 51.3, 19.3 and 120 g,

Investigation of petroleum ether extract:

1. *Preparation of the unsaponifiable matter and fatty acid methyl esters:*

Ten grams of the petroleum ether extract of the leaves were subjected to saponification and the unsaponifiable matter, as well as the fatty acid methyl esters were prepared adopting the reported methods

(Johnson and Davenport, 1971 and Vogel, 1961) to give 6.8 g of the unsaponifiable matter and 2.1g of the saponifiable matter (fatty acids).

GC/MS analysis of unsaponifiable matter and fatty acid methyl esters:

The unsaponifiable matter and fatty acid methyl esters were subjected to GC/MS analysis adopting the above mentioned conditions. The identification of the compounds was accomplished by comparing their retention times and mass spectral data with those of the library and published data (Adams, 1989 and Eight peaks Index, 1974) Quantitative determinations were carried out based on peak area measurements. The results are listed in Tables 1&2.

Fractionation of the petroleum ether extract by column chromatography:

Twenty grams of the petroleum ether extract were subjected to fractionation on VLC column using silica gel (G 60 F 254) (Merck) as the stationary phase and petroleum ether (60-80) as the mobile phase. Fifty fractions were collected and monitored by TLC using the solvent system: benzene-acetone (9:1) and spraying with 10% H_2SO_4 and heating at 110 °C. Fractions No. 22 to 33 were pooled and subjected to preparative TLC using the same solvent system. Four bands were separately scratched and eluted by chloroform, having the following R_f values and colours: 0.5 (pink), 0.61 (green), 0.66 (faint brown), 0.73 (violet), corresponding to the sterol fraction and three triterpenoid compounds 1, 2 and 3 respectively. The sterol fraction was subjected to GLC adopting the above mentioned conditions. The constituents of the sterol mixture were identified by comparing their R_t values with those of authentic sterols and their relative percentages were determined by peak area measurements. Compounds 1, 2 and 3 were identified by determination of their mp, IR, MS data and comparing them with those of the published data.

Acute toxicity test (LD_{50}):

The total ethanol extract of *A. pavonina* leaves was subjected to LD_{50} determination according to the method described by Miller and Tainter (1944). Male albino mice (25-30 g) were divided into groups each of six animals. Preliminary experiments were done to determine the minimum dose that kills all animals (LD_{100}) and the maximum dose that fails to kill any animal. Several doses at equal logarithmic intervals were chosen in between these two doses, each dose was injected into a group of six animals by subcutaneous injection. The mice were then observed for 24 hours and symptoms of toxicity and mortality rates in each group were recorded and LD_{50} was calculated.

Anti-inflammatory activity test:

The anti-inflammatory test was evaluated adopting the carrageenan-induced rat hind paw oedema test (Winter *et al*., 1962). This model uses carrageenan as an irritant to induce paw oedema. Non-steroidal anti-inflammatory drugs such as indomethacin, reduce paw swelling in a dose-dependent manner to a maximum of 60 %. Test materials are assessed for acute anti-inflammatory activity by examining their ability to reduce or prevent the development of carrageenan-induced paw swelling. Forty eight adult male albino rats, divided into eight groups, each of six animals, each was orally treated with one of the following: 50 and 100 mg/kg b. wt. of the total ethanol extract, 100 mg/kg b. wt. of each successive extract, indomethacin and saline (negative control) as shown in Table 3. One hour after oral administration, all animals were given a sub-plantar injection of 0.1 ml of 1 % carrageenan solution in saline in the right hind paw and 0.1 ml saline in the left hind paw. Four hours after oral administration, the rats were sacrificed. Both hind paws were, separately, excised and weighed. Oedema % and oedema inhibition % were calculated according to the following equations, respectively.

$$\% \text{ Oedema} = \frac{(\text{wt. of right paw} - \text{wt. of left paw}) \times 100}{\text{wt. of left paw}}$$

$$\% \text{ Oedema inhibition} = \frac{(Mc - Mt) \times 100}{Mc}$$

Mc = the mean oedema in the control group
Mt = the mean oedema in the drug-treated group

The results were statistically analyzed using the Student's "*t*" test (Snedecor and Cochran, 1982) and illustrated in Table 3. Results with $p < 0.01$ were considered statistically significant.

Results and Discussion

Unsaponifiable matter:

GC/MS analysis of the unsaponifiable matter of *A. pavonina* leaves (Table 1) revealed the identification of 50 compounds constituting 80.1 % of the total composition. Squalene was found to be the major compound representing 16.38% followed by n-hentriacontane (14.61%), phytol (10.9%) and 2, 2-diethoxy ethanamine (8.34%). The percentage of total oxygenated compounds, representing 16.02%, was mainly attributed to phytol (10.9%).

Table 1: Results of GC/MS analysis of the unsaponifiable matter of *A. pavonina* L. Leaves.

Noo	Compound	RR_t	B.P.	M^+	Rel. %	M. Formula
1	Limonene	0.20	68	136	0.49	$C_{10}H_{16}$
2	n-Undecane	0.25	57	156	0.48	$C_{11}H_{24}$
3	3,6,6-Trimethyl-bicyclo[3.1.1] heptan-2-one	0.26	83	152	traces	$C_{10}H_{16}O$
4	n-Amylcyclohexane	0.27	83	154	0.20	$C_{11}H_{22}$
5	4-Methyl undecane	0.29	43	170	0.75	$C_{13}H_{28}$
6	n-Dodecane	0.315	57	170	2.66	$C_{12}H_{26}$
7	2,6-Dimethyl undecane	0.32	57	184	0.76	$C_{13}H_{28}$
8	2,2-Diethoxy ethanamine	0.33	103	133	8.34	$C_6H_{15}NO_2$
9	Hexyl cyclohexane	0.34	83	168	0.66	$C_{12}H_{24}$
10	1,1,1-Triethoxyethane	0.349	61	162	0.48	$C_8H_{18}O_3$
11	4,8 Dimethyl undecane	0.35	71	184	traces	$C_{13}H_{28}$
12	n-Tridecane	0.36	57	184	0.17	$C_{13}H_{28}$
13	1-Undecanol	0.432	83	172	traces	$C_{11}H_{24}O$
14	3,3-Diethoxy-1-propanol	0.434	103	148	0.29	$C_7H_{16}O_3$
15	1,1-Diethoxy decane	0.436	103	198	0.29	$C_{14}H_{30}$
16	n-Pentadecane	0.489	57	212	traces	$C_{15}H_{32}$
17	β – Ionone	0.49	177	192	traces	$C_{13}H_{20}O$
18	Butylated hydroxyl toluene	0.50	205	220	0.49	$C_{15}H_{24}O$
19	2,5-Ditert-butyl phenol	0.51	191	206	0.16	$C_{14}H_{22}O$
20	5,6,7,7a-Tetrahdro4,4,7a trimethyl, 2(4H)- benzofuranone	0.53	111	180	0.47	$C_{11}H_{16}O_2$
21	1-Hexadecene	0.538	55	244	0.11	$C_{16}H_{32}$
22	n-Hexadecane	0.540	57	226	0.10	$C_{16}H_{34}$
23	1-Tetradecanol	0.543	83	214	traces	$C_{14}H_{30}O$
24	n-Heptadecane	0.59	57	240	0.16	$C_{17}H_{36}$
25	1-Octadecene	0.632	43	252	traces	$C_{18}H_{36}$
26	n-Octadecane	0.634	57	254	0.18	$C_{18}H_{38}$
27	Neophytadiene	0.65	68	278	0.44	$C_{20}H_{38}$
28	6,10,14-Trimethyl-2-pentadecanone	0.66	58	268	4.18	$C_{18}H_{36}O$
29	1-Eicosyne	0.67	95	278	0.26	$C_{20}H_{38}$
30	n-Nonadecane	0.678	57	268	traces	$C_{19}H_{40}$
31	6,10,14 –Trimethyl-5,9,13-pentadecatrien-2-one	0.69	69	262	0.13	$C_{18}H_{30}O$
32	Isophytol	0.70	71	296	traces	$C_{20}H_{40}O$
33	1-Eicosene	0.717	83	280	traces	$C_{20}H_{40}$
34	n-Eicosane	0.719	57	282	0.10	$C_{20}H_{42}$
35	n-Heneicosane	0.76	57	296	0.16	$C_{21}H_{44}$
36	Phytol	0.769	71	296	10.29	$C_{20}H_{40}O$
37	n-Docosane	0.79	57	310	0.23	$C_{22}H_{46}$
38	n-Tricosane	0.83	57	324	0.24	$C_{23}H_{48}$
39	n-Tetracosane	0.87	57	338	0.23	$C_{24}H_{50}$
40	n-Pentacosane	0.90	57	352	0.47	$C_{25}H_{52}$
41	n-Hexacosane	0.93	57	366	0.33	$C_{26}H_{54}$
42	n-Heptacosane	0.96	57	380	0.90	$C_{27}H_{56}$
43	n-Octacosane	0.99	57	394	0.69	$C_{28}H_{58}$
44	Squalene	1	69	410	16.38	$C_{30}H_{50}$
45	n-Nonacosane	1.02	57	408	6.41	$C_{29}H_{60}$
46	n-Triacontane	1.05	57	422	1.76	$C_{30}H_{62}$
47	n-Hentriacontane	1.08	57	436	14.61	$C_{31}H_{64}$
48	Vitamin E	1.11	165	430	2.10	$C_{29}H_{50}O_2$
49	n- Dotriacontane	1.12	57	450	1.25	$C_{32}H_{66}$
50	n-Tritriacontane	1.16	57	464	1.70	$C_{33}H_{68}$
	Identified constituents	-	-	-	80.10	-
	Unidentified constituents	-	-	-	19.90	-

RR_t = Retention time relative to squalene ($R_{t} = 46.94$), B.P. = base peak, M^+= molecular weight, Traces = < 0.1

Fatty acid methyl esters:

GC/MS analysis of the fatty acid methyl esters (Table 2) revealed the identification of 24 fatty acids representing 88.49 % of the total fatty acid constituents. Methyl hexadecanoate (19.25%), methyl 9, 12, 15-octadecatrienoate (12.69%), methyl eicosanoate (10.14%), methyl-9- octadecenoate (10.06%) and methyl 9, 12-octadecadienoate (9.23 %) were found to be the major compounds. The total unsaturated fatty acids represented 33.67% of which two monounsaturated fatty acids (10.6%) and two polyunsaturated fatty acids (23.07) were identified.

Table 2: Results of GC/MS analysis of the fatty acid methyl esters of *A pavonina* L. Leaves.

No.	Compound	RR_t	B.P.	M^+	Rel. %	Mol. Formula
1	Methyl dodecanoate	0.73	74	214	0.69	$C_{13}H_{26}O_2$
2	Methyl 3,7,11-trimethyl dodecanoate	0.83	101	256	**traces**	$C_{16}H_{32}O_2$
3	Methyl tetradecanoate	0.87	74	242	3.44	$C_{15}H_{30}O_2$
4	Methyl 4,8,12-trimethyl tridecanoate	0.901	87	270	**traces**	$C_{17}H_{34}O_2$
5	Methyl, 9 pentadecenoate	0.92	41	254	0.54	$C_{16}H_{30}O_2$
6	Methyl pentadecanoate	0.94	74	256	**traces**	$C_{16}H_{32}O_2$
7	Methyl 5,9,13trimethyl tetradecanoate	0.96	74	284	0.14	$C_{18}H_{36}O_2$
8	Methyl hexadecanoate	1	74	270	19.25	$C_{17}H_{34}O_2$
9	Methyl heptadecanoate	1.05	74	284	0.42	$C_{18}H_{36}O_2$
10	Methyl 9,12-octadecadienoate	1.09	67	294	9.23	$C_{19}H_{34}O_2$
11	Methyl 9-octadecenoate	1.10	55	296	10.06	$C_{19}H_{36}O_2$
12	Methyl-9,12,15-octadecatrienoate	1.11	79	292	12.69	$C_{19}H_{32}O_2$
13	Methyl octadecanoate	1.12	74	298	8.32	$C_{19}H_{38}O_2$
14	Methyl nonadecanoate	1.17	74	312	0.54	$C_{20}H_{40}O_2$
15	Methyl eicosanoate	1.22	74	326	10.14	$C_{21}H_{42}O_2$
16	Methyl heneicosanoate	1.31	74	340	0.44	$C_{22}H_{44}O_2$
17	Methyl docosanoate	1.32	74	354	1.86	$C_{23}H_{46}O_2$
18	Methyl tricosanoate	1.36	74	368	0.45	$C_{24}H_{48}O_2$
19	Methyl tetracosanoate	1.41	74	382	3.22	$C_{25}H_{50}O_2$
20	Methyl pentacosanoate	1.45	74	396	0.43	$C_{26}H_{52}O_2$
21	Methyl hexacosanoate	1.49	74	410	2.89	$C_{27}H_{54}O_2$
22	Methyl heptacosanoate	1.54	74	424	0.78	$C_{28}H_{56}O_2$
23	Methyl octacosanoate	1.58	74	438	2.10	$C_{29}H_{58}O_2$
24	Methyl nonacosanoate	1.64	74	452	0.86	$C_{30}H_{60}O_2$
	Identified constituents	-	-	-	88.49	-
	Unidentified constituents	-	-	-	11.51	-

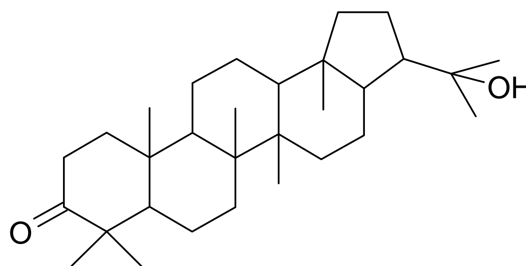
RRt = Retention time relative to methyl hexadecanoate (Rt =32.61).

Sterol fraction:

GLC analysis of the sterol fraction revealed that it consisted of a mixture of cholesterol (1.54%), campesterol (6.75%), stigmasterol (62.28%) and β - sitosterol (29.43%).

Compound 1:

White crystals, (6 mg), mp 247-249 °C (reported mp, 250 °C, Devon, Scott,1972); IR υ max (KBr) cm^{-1}: 3408 (OH), 2923 & 2853 (CH, CH_2, CH_3), 1461 (CH_3), 1735 (CO), 1375 (gem dimethyl), 1264, 1167, 1120, 1068, 759, 725, 700; EIMS, m/z (rel. int.): 442 (M^+), 424 (15), 419 (30), 402 (25), 386 (10), 233 (25), 218 (45), 205 (10) 203 (30), 189 (18), 161 (20), 149 (100), 133 (50), 121 (30), 107 (45), 89 (50). From these data, this compound is identified as 22-hydroxy hopan-3-one ($C_{30}H_{50}O_2$), as compared with the published data (Koops *et al.*, 1991)



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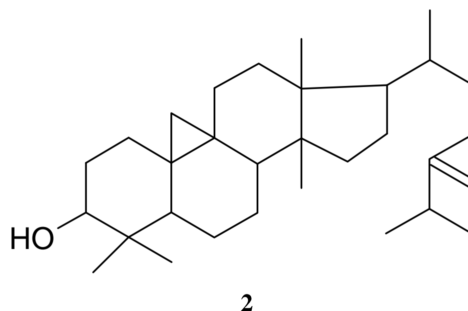
Compound 2:

White crystals, (5 mg) mp 120-122 °C (reported mp,122 °C, Devon, Scott,1972) IR υ $_{max}$ (KBr) cm^{-1}: 3445 (OH), 2920 & 2850 (CH, CH_2, CH_3), 1457(CH_3), 1382 (gem dimethyl), 876 (Terminal methylene), 1260, 1163, 996, 838; EIMS, m/z (rel. int.): 440 (M^+, 5), 428 (5), 425 (5), 424 (5), 393 (2), 362 (4), 337 (5), 205 (2),193 (10), 125 (20), 111 (35), 97 (55), 83 (70), 69 (58), 71 (52), 57 (100), 55 (72). As comparing with the reported data (El- Shamy, *et al.*, 1992 and Abou Zeid and Awad 1994) this compound is identified as 24-methylene cycloartanol($C_{31}H_{52}O$).



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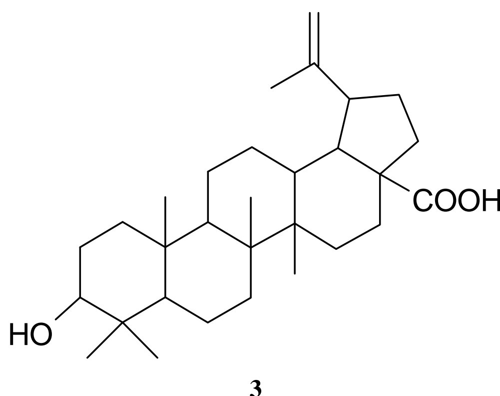
Compound 3:

White needles, (8 mg) mp 291-293 °C (reported mp, 289-291°C, Boonruad, and Chansuwanich, 2000); IR υ max (KBr) cm-1: 3416 (OH), 2924 & 2854 (CH, CH_2, CH_3), 1459 (CH_3), 1375 (gem dimethyl), 1690 (C=O), 1259 (OH carboxyl), 1170 (C-O), 893 (Terminal methylene); EIMS, m/z (rel. int): 456 (M^+, 2), 451 (4), 438 (2), 422 (3), 410 (3), 401 (3), 362 (4), 345 (3), 315 (6), 297 (8), 268 (6), 259 (2), 255 (3), 221 (6), 208 (4), 207 (2), 189 (5), 175 (4), 161 (6), 147(12), 135 (12), 121 (15) 119 (10), 109 (18), 105 (17), 83 (65), 69 (65), 43(100). This compound is identified as betulinic acid (3-hydroxy-20(29)-lupen-28-oic acid) ($C_{30}H_{48}O_3$), by comparing its data with those of the published ones (Igoli and Gray, 2008).



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This compounds were isolated from the plant under investigation for the first time in the current study, while they were reported to be isolated from other plants belonging to Family Fabaceae. Cycloartanol was detected in seed oil of *Acrocarpus fraxinifolius* (Tariq *et al.*, 1991). 24-Methylenecycloartanol was isolated from *Piptadenia gonoacantha*, subfamily Mimosoideae, (de Carvalho *et al.*, 2010). While betulinic acid was isolated from *Peltophorum africanum* (Theo *et al.*, 2009).

Acute toxicity test (LD_{50}):

The acute toxicity test revealed that LD_{50} of the total ethanol extract of the leaves of the plant was found to be 5.8 g/kg body wt. From this result the plant is considered to be safe, This is confirmed by what was reported about the seeds, young leaves and fruits that could be cooked and eaten (Corner, 1997, Benthall, 1946 and Clark and Thaman, 1993).

Anti-inflammatory activity test:

The results of the acute anti-inflammatory test of two doses of total ethanol extract (50 and 100 mg/ kg body wt.) and 100 mg/ kg body wt. dose of the successive extracts of the leaves (Table 3) revealed that

significant anti-inflammatory effects are exhibited by oral administration of the doses of the different extracts. They significantly inhibited the rat paw oedema weight induced by carrageenan. This effect was found to be dose dependant in the total ethanol extract. The most potent extract was the total ethanol extract, 100 mg/kg b.wt. (91.27 %) followed by aqueous ethanol extract (89.15 %), chloroform extract (79.89 %), ethyl acetate extract (70.10 %), petroleum ether extract (65.34 %) in comparison with indomethacin (100 % potency).

These results are in agreement with those reported on the significant in vivo anti-inflammatory activities exhibited by the extracts of *A. pavonina* in the carrageenan-induced rat paw oedema model providing a scientific evidence to the traditional uses of this plant for treatment of various inflammatory conditions, e.g. gout, rheumatism and tumours (Arzumand *et al.*, 2010). Also our results are supported by the significant anti-inflammatory activity in rats exhibited by the ethanol leaf extract of *A. pavonina,* which may be related to the presence of active constituents such as flavonoids, *β*-sitosterol and stigmasterol. A possible mechanism may also be due to the inhibition of prostaglandin synthesis (Mayuren and Ilavarasan, 2009)**.**

The anti-inflammatory activity exhibited by the petroleum ether extract in our study may be due to the sterol and triterpenoid contents of the pet. ether extract. This data is supported by many authors, who reported that triterpenoids (Recio *et al.* 1995 and Safayli and Sailer, 1997) and β- sitosterol (Gupta, 1980) exhibited anti-inflammatory activity in carragenaan paw oedema model. Also, it was reported that a marked anti-inflammatory activity was exhibited by twelve triterpene alcohols and *β*- sitosterol-glucoside in mice with inflammation induced by phorbol derivative (Yasukawa *et al.,* 2000).

Conclusion:

From the above results it could be concluded that *A. pavonina* is considered to be safe and could be used as a potent anti-inflammatory agent after carrying out the clinical studies.

Table 3: Results of anti-inflammatory activity test of the extracts of *Adenanthera pavonina* L. leaves.

Group	Dose (mg / kg b. wt.)	% of Oedema		% Potency
		Mean ± S.E.	% inhibition	
Control	1 ml saline	59.4±1.9	00	00
Total ethanol	50	35.1±1.1*	40.90	64.27
	100	24.9±0.6*	58.08	91.27
Petroleum ether	100	34.7±1.4*	41.58	65.34
Chloroform	100	29.2±0.19*	50.84	79.89
Ethyl acetate	100	32.9±1.2*	44.61	70.10
Aqueous ethanol	100	25.7±0.6*	56.73	89.15
Indomethacin	20	21.6±0.7*	63.63	100

* Significantly different from the control at $p < 0.01$.

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